Efficiency Maine
Business Energy Audit Program
Walk-through Energy Report

Waldo County Technical Center
1022 Waterville Road
Waldo, ME 04915

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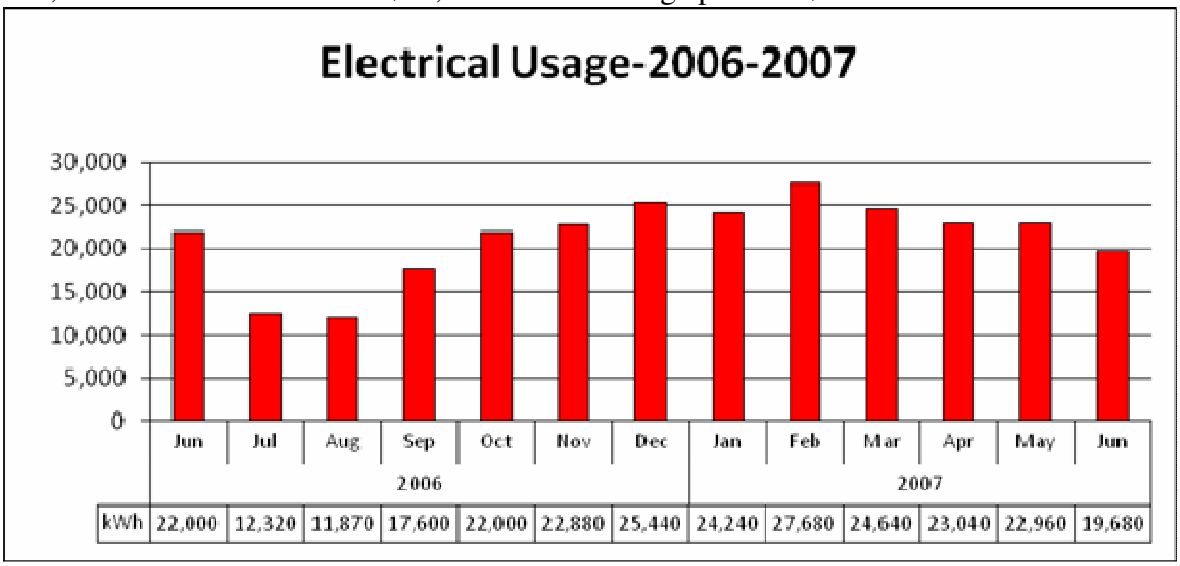
Audit Date:	March 13, 2008
Follow-up Date:	September 2008
Building Sq. Ft.:	~ 50,000 square feet
# Employees:	30
Hours of operation:	7:30-3:00
Business Type:	Vocational School Elementary/Secondary
Fed tax ID:	#01-0327859
Electric Utility Co:	CMP
Environment:	Sunny 30°F

SITE DESCRIPTION

The facility of Waldo County Technical Center was originally open in 1975 and supports the high school communities of Searsport, Belfast and Mt View.

A new roof with four new classrooms were added in 1994. Several studies conducted during the period prior to the additions and renovations found no structural deficiencies or problems needing attention. Because the original structure was so solidly built, all the changes have been mostly related to wear, code changes, energy efficiencies, or new and improved areas for current programs.

Electricity usage in kWh's is graphed below from June 2006 – June 2007 for a total of 276,350 kilowatts at a cost of $44,495 and an average price of $.16 a kilowatt.

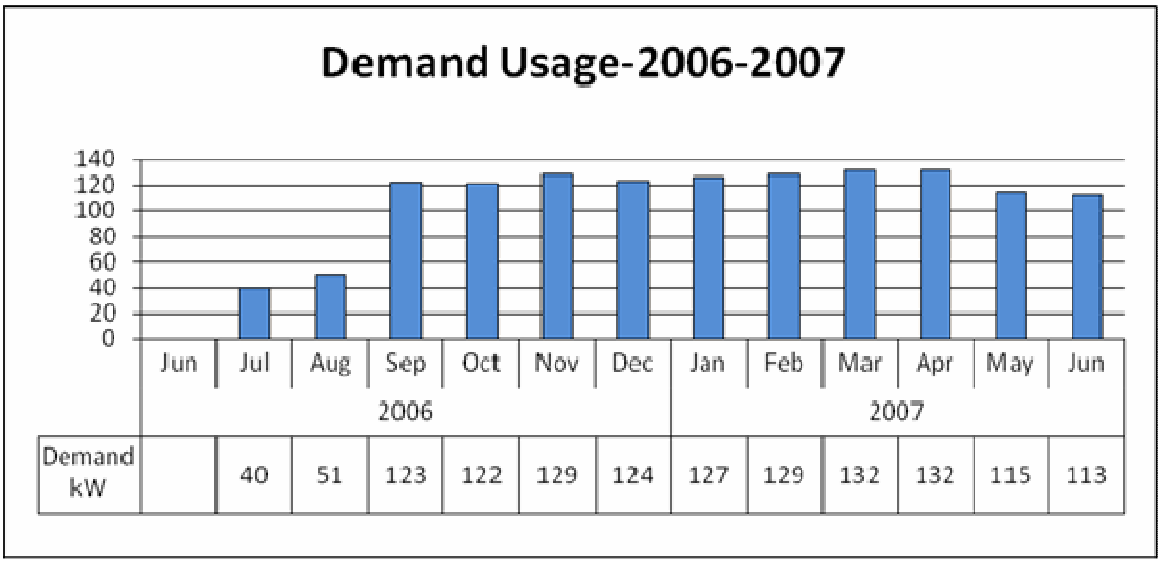


Waldo County Technical Center					
Electricity Usage-2006-2007					
		kWh	Cost	Demand kW	Demand Cost
2006	Jun	22,000	3,296		
	Jul	12,320	1,722	40	296
	Aug	11,870	1,767	51	391
	Sep	17,600	2,969	123	939
	Oct	22,000	3,464	122	935
	Nov	22,880	3,620	129	990
	Dec	25,440	4,298	124	1,290
2007	Jan	24,240	4,244	127	1,322
	Feb	27,680	4,615	129	1,345
	Mar	24,640	4,187	132	1,322
	Apr	23,040	3,661	132	1,013
	May	22,960	3,523	115	884
	Jun	19,680	3,129	113	863
	Total	**276,350**	**$44,495**	**1,337**	**$11,590**
Avg	mo	23,029	$3,708	111	$966
Avg	$/kW	$0.16			

Demand Charge : What is the Demand Charge? The demand meter constantly measures energy consumption. The demand charge is based on the highest amount of energy used in any given 15 minute period during the typical 30 day billing cycle.

The demand meter constantly monitors all electrical consumption on the service. At the end of the typical 30 day billing cycle, the monthly demand charge is applied to the metered "kW's".

A strategy to reduce demand charges can begin with education of all personnel who use your facility. You can stagger the on/off time of devices that use a significant amount of electricity such as large HP Motors, refrigeration, etc., or consider a different service with Peak and Off Peak charges. You may also reduce consumption by replacing older inefficient equipment with energy efficient equipment. The demand usage in kW's for your facility is graphed below:



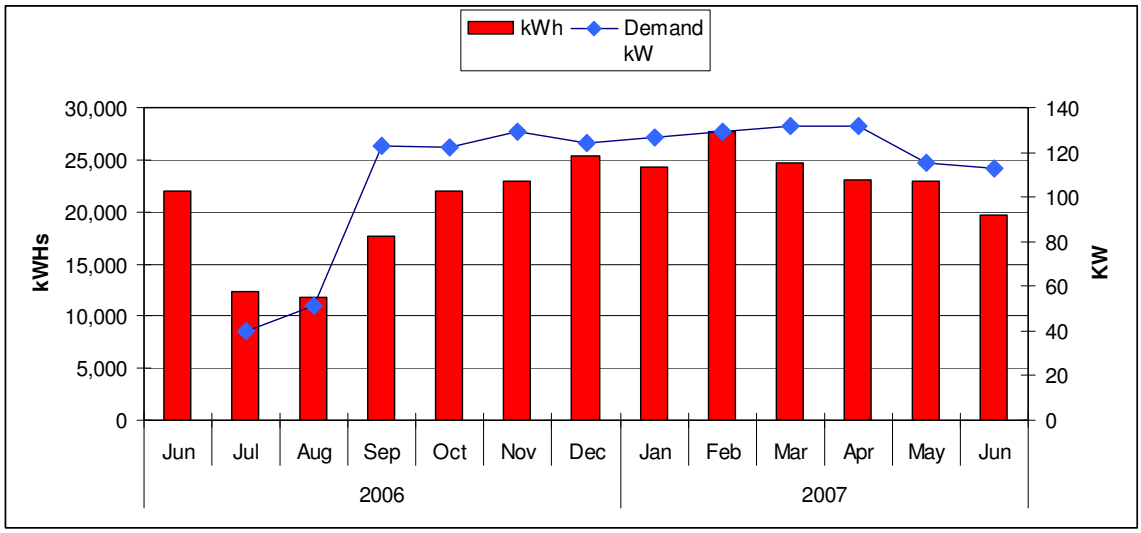
For detailed information regarding your electric bill and your current level of service go to the CMP web site below and select the **Medium General Service Secondary** schedule (note: you have 3 phase service):
http://www.cmpco.com/YourBusiness/pricing/pricingSchedules/default.html

RATE MGS-S
MEDIUM GENERAL SERVICE - SECONDARY

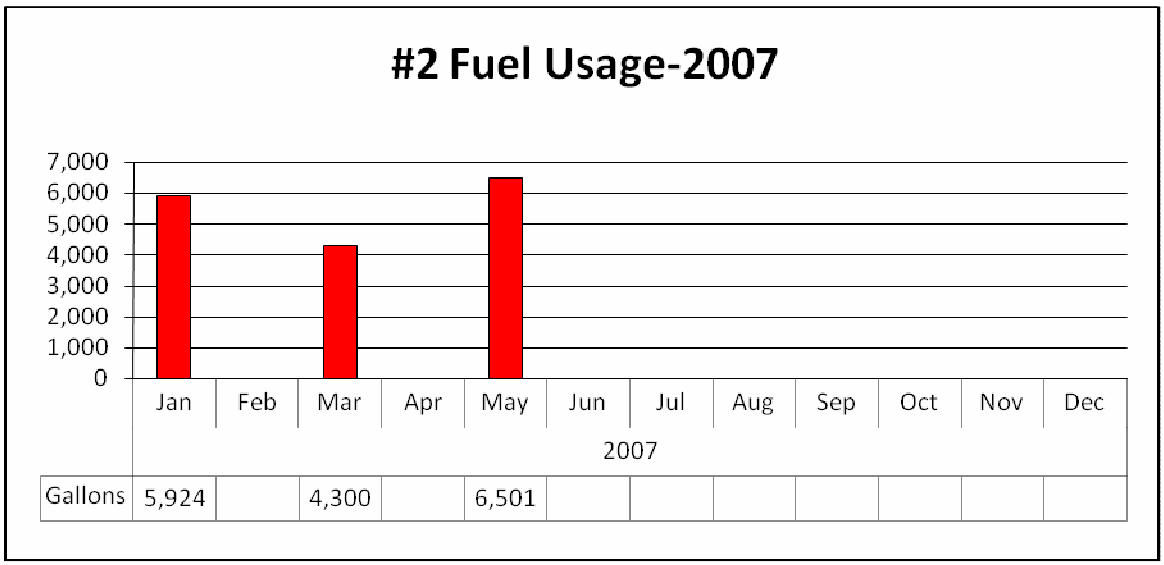
BASIC RATE PER MONTH

	Winter Billing Months December - March	Non-Winter Billing Months April - November
Service Charge		
Single Phase	$24.46	$24.46
Three Phase	$31.90	$31.90
Demand Charge	$8.46/kW	$6.20/kW
kWh Charge	$0.004794/kWh	$0.004794/kWh

The graph below has the kWh's (consumption) and kW's (electrical demand) plotted together. It is important to review this relationship on a monthly basis. If the demand increases and the kWh's remain stable, then this may indicate the intermittent use of a large motor or that a motor could be going bad. In your case there are no anomalies regarding the demand kW.

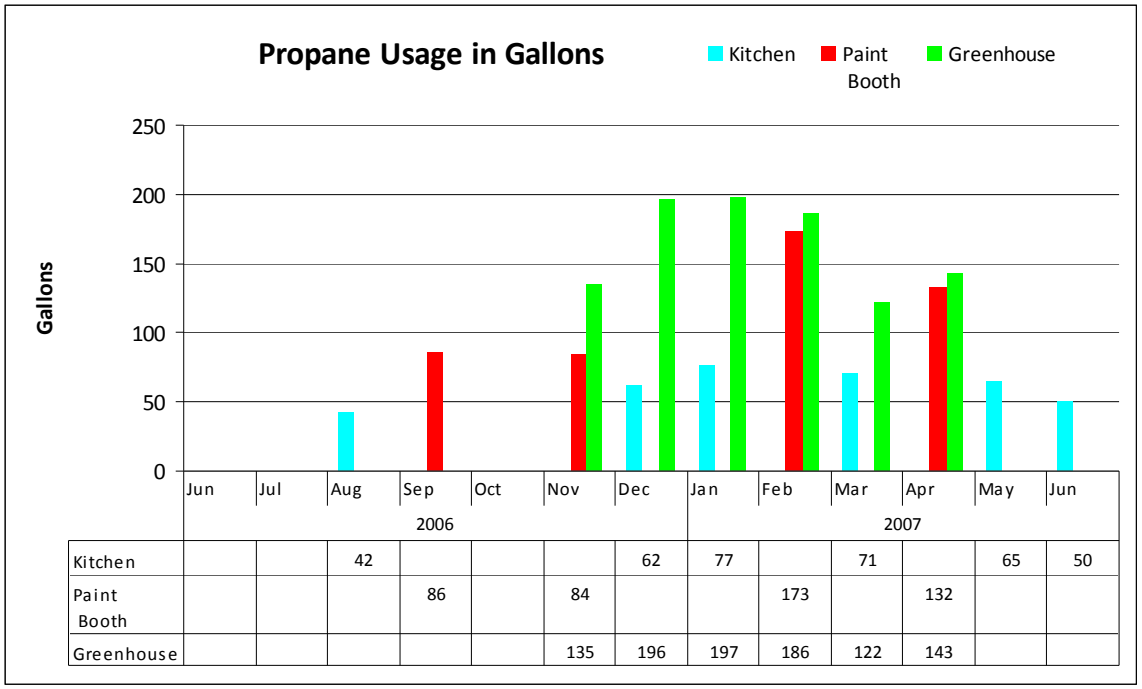


Fuel oil is also graphed below for the year 2007 for a total of 16,725 gallons at a cost of $34,550 for an average price of $2.07 a gallon.



Waldo County Technical Center			
#2 Fuel Usage-2007			
		Gallons	Cost
2007	Jan	5,924	12,100
	Feb		
	Mar	4,300	9,183
	Apr		
	May	6,501	13,267
	Jun		
	Jul		
	Aug		
	Sep		
	Oct		
	Nov		
	Dec		
	Total	**16,725**	**$34,550**
Monthly	Average	1,394	$2,879
$/gal	Average		$2.07

Propane is provided by three separate tanks for the kitchen, paint booth, and greenhouse and is graphed below:



	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Kitchen			42				62	77		71		65	50
Paint Booth				86		84			173		132		
Greenhouse						135	196	197	186	122	143		

Waldo County Technical Center							
Propane Usage-2006-2007							
		gal	cost	gal	cost	gal	cost
		Kitchen	Kitchen	Paint Booth	Paint Booth	Greenhouse	Greenhouse
2006	Jun						
	Jul						
	Aug	42	72				
	Sep			86	146		
	Oct						
	Nov			84	143	135	230
	Dec	62	106			196	334
2007	Jan	77	132			197	335
	Feb			173	294	186	316
	Mar	71	121			122	208
	Apr			132	225	143	243
	May	65	110				
	Jun	50	87				
	Total	**367**	**$628**	**475**	**$808**	**979**	**$1,666**
Total gallons		1,821					
Total cost		$3,102					
Avg $/gal		$1.70					

LIGHTING

Do-It-Yourself Measures:

- ☐ **Clean Fixtures**
- ☐ **Repaint or clean reflective surfaces**
- ☒ **Reduce Wattage**
- ☒ **Reschedule Custodial Services**
- ☒ **Reset Exterior Lighting Schedule**
- ☐ **Relamp Incandescent to Compact Fluorescent**

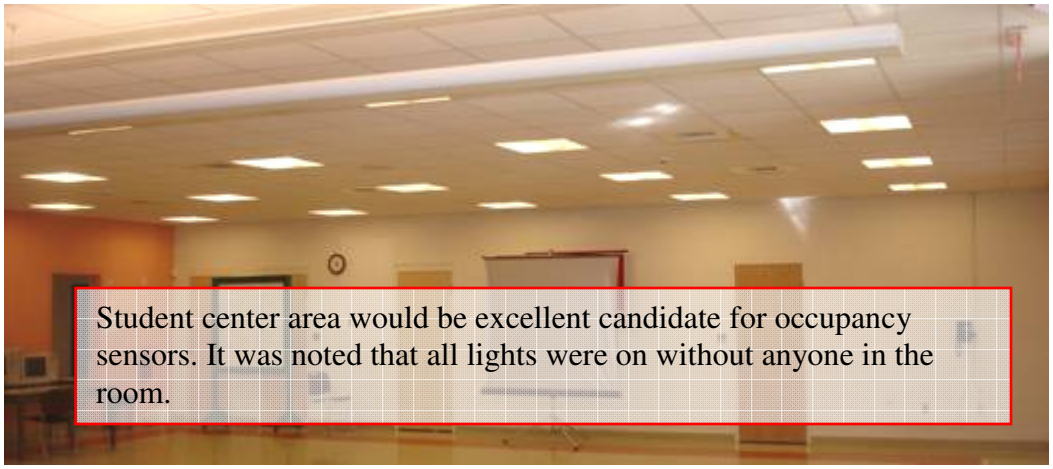
Service Technician:

- ☒ **Install Occupancy Sensors**
- ☐ **Install Dimmer Switches**
- ☐ **Install Photoelectric Cells**
- ☐ **Relamp outside lights to High Pressure Sodium**
- ☐ **Install Lighting Time Clocks**
- ☒ **Install Additional Switching**
- ☐ **Install LED or Electroluminescent Exit Signs**

Comments: The tables below provide an approximate potential for energy savings opportunities to reduce electrical lighting consumption throughout the facility. It is a guide to help you understand and plan for achieving **energy savings** by managing your building lighting.

Table notes and annual operating hour assumptions:

- Tables based on $.15 per KW
- Hours reported as: Mon–Fri 7:30 AM–3:00 PM
- Hours per day used in the tables are based on reported usage during walkthrough
- The lighting reductions under the suggested retrofit are assumptions based on percentages; they could be greater or less.

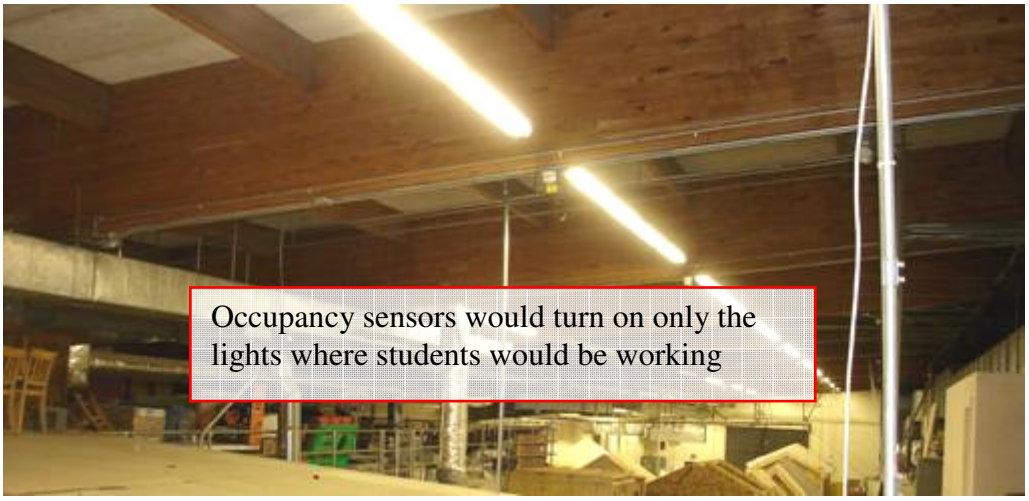


Student center area would be excellent candidate for occupancy sensors. It was noted that all lights were on without anyone in the room.

Below is the summary of estimated potential energy savings for lighting. These savings represent 30% of the operating cost and were calculated based on the installation of occupancy sensors throughout the facility.

Waldo County Technical Center Lighting Summary Table				
	Yearly Total kWh	Annual Cost @ $.15kWh	Potential Annual Savings	Annual kWh Saved
Total Estimated Lighting Use and Savings	71,290	$10,694	$3,259	21,728

Waldo County Technical Center												
	Location	Fixture type	# of fixtures	Watts per Fixture	Daily Total kWh	Hrs/ Day	# of Days	Annual Operating Hours	Yearly Total kWh	Annual Cost @ $.15kWh	Potential Annual Savings	Annual kWh Saved
Existing	Small engine shop	2L 2x4 T8	28	58	1.624	7.5	180	1350	2,192	$329		
Retrofit	Small engine shop	Occupancy sensor	28	58	1.624	5.5	180	990	1,608	$241	$88	585
Existing	Small engine shop	2L 2x4 T8	84	58	4.872	6	180	1080	5,262	$789		
Retrofit	Small engine shop	Occupancy sensor	84	58	4.872	5	180	900	4,385	$658	$132	877
Existing	Welding	2L 2x4 T8	42	58	2.436	7.5	180	1350	3,289	$493		
Retrofit	Welding	Occupancy sensor	42	58	2.436	5	180	900	2,192	$329	$164	1,096
Existing	Welding Classroom	2L 2x4 T8	12	58	0.696	7.5	180	1350	940	$141		
Retrofit	Welding Classroom	Occupancy sensor	12	58	0.696	3	180	540	376	$56	$85	564
Existing	Horticulture	2L 2x4 T8	40	58	2.32	7.5	180	1350	3,132	$470		
Retrofit	Horticulture	Occupancy sensor	40	58	2.32	5.5	180	990	2,297	$345	$125	835
Existing	Woodshop	2L 2x4 T8	128	58	7.424	8	180	1440	10,691	$1,604		
Retrofit	Woodshop	Occupancy sensors	128	58	7.424	6	180	1080	8,018	$1,203	$401	2,673
Existing	Woodshop tool storage	2L 2x4 T12	8	75	0.6	8	180	1440	864	$130		
Retrofit	Woodshop tool storage	2L 2x4 T8 Occupancy Sensor	8	58	0.464	1	180	180	84	$13	$117	780
Existing	Café Classroom	3L 2x4 T8	6	87	0.522	8	180	1440	752	$113		
Retrofit	Café Classroom	Occupancy Sensor	6	87	0.522	4	180	720	376	$56	$56	376
									Yearly Total kWh	Annual Cost @ $.15kWh	Potential Annual Savings	Annual kWh Saved
									27,121	$4,068	$1,168	7,786



Waldo County Technical Center con't												
	Location	Fixture type	# of fixtures	Watts per Fixture	Daily Total kWh	Hrs/ Day	# of Days	Annual Operating Hours	Yearly Total kWh	Annual Cost @ $.15kWh	Potential Annual Savings	Annual kWh Saved
Existing	Kitchen	2L 2x2 T8	20	58	1.16	7.5	180	1350	1,566	$235		
Retrofit	Kitchen	Occupancy sensors	20	58	1.16	5.5	180	990	1,148	$172	$63	418
Existing	Child care	3L 2x4 T8	38	87	3.306	7.5	180	1350	4,463	$669		
Retrofit	Child care	Occupancy sensors	38	87	3.306	6.5	180	1170	3,868	$580	$89	595
Existing	Strive Room	3L 2x4 T8	9	87	0.783	7.5	180	1350	1,057	$159		
Retrofit	Strive Room	Occupancy sensors	9	87	0.783	5.5	180	990	775	$116	$42	282
Existing	Graphic Arts	1L 1x4 T8	25	30	0.75	7.5	180	1350	1,013	$152		
Retrofit	Graphic Arts	Occupancy sensors	25	30	0.75	5.5	180	990	743	$111	$41	270
Existing	Network Computer	4L 2x4 T8	24	114	2.736	7.5	180	1350	3,694	$554		
Retrofit	Network Computer	Occupancy sensors	24	114	2.736	5.5	180	990	2,709	$406	$148	985
Existing	Computer Labs	4L 2x4 T8	24	114	2.736	7.5	180	1350	3,694	$554		
Retrofit	Computer Labs	Occupancy sensors	24	114	2.736	5.5	180	990	2,709	$406	$148	985
Existing	Police	2L 2x4 T8	12	58	0.696	7.5	180	1350	940	$141		
Retrofit	Police	Occupancy sensors	12	58	0.696	5.5	180	990	689	$103	$38	251
Existing	Electrical	2L 2x4 T8	12	58	0.696	7.5	180	1350	940	$141		
Retrofit	Electrical	Occupancy sensors	12	58	0.696	5.5	180	990	689	$103	$38	251
Existing	Health	3L 2x4 T8	24	87	2.088	7.5	180	1350	2,819	$423		
Retrofit	Health	Occupancy sensors	24	87	2.088	5.5	180	990	2,067	$310	$113	752
									Yearly Total kWh	Annual Cost @ $.15kWh	Potential Annual Savings	Annual kWh Saved
									20,184	$3,028	$718	4,787

Waldo County Technical Center con't												
	Location	Fixture type	# of fixtures	Watts per Fixture	Daily Total kWh	Hrs/ Day	# of Days	Annual Operating Hours	Yearly Total kWh	Annual Cost @ $.15kWh	Potential Annual Savings	Annual kWh Saved
Existing	Front Lobby	2L 2x4 T8 utubes	12	58	0.696	9	180	1620	1,128	$169		
Retrofit	Front Lobby	Occuancy sensors	12	58	0.696	4	180	720	501	$75	$94	626
Existing	Student Ctr Café	1L 2x4 T8 Pendants	30	20	0.6	7.5	180	1350	810	$122		
Retrofit	Student Ctr Café	Occupancy sensors-75%	30	20	0.6	2	180	360	216	$32	$89	594
Existing	Student Ctr	1L 2x2 T8	20	20	0.4	7.5	180	1350	540	$81		
Retrofit	Student Ctr	Occupancy sensors-75%	20	20	0.4	2	180	360	144	$22	$59	396
Existing	Café Hallway	2L 2x2 T8	10	58	0.58	7.5	180	1350	783	$117		
Retrofit	Café Hallway	Occupancy sensors-50%	10	58	0.58	2	180	360	209	$31	$86	574
Existing	Main Hallway	2L 2x4 T8	20	58	1.16	7.5	180	1350	1,566	$235		
Retrofit	Main Hallway	Occupancy sensors-50%	20	58	1.16	4	180	720	835	$125	$110	731
Existing	Exit Signs	CFL Incandescen	7	20	0.14	24	180	4320	604.8	$91		
Retrofit	Exit Signs	LED	7	1	0.007	24	180	4320	30.24	$5	$86	575
									Yearly Total kWh	Annual Cost @ $.15kWh	Potential Annual Savings	Annual kWh Saved
									5,431	$815	$524	3,496

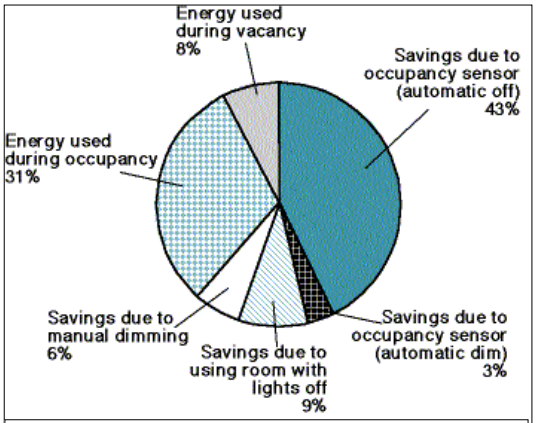
Waldo County Technical Center con't												
	Location	Fixture type	# of fixtures	Watts per Fixture	Daily Total kWh	Hrs/ Day	# of Days	Annual Operating Hours	Yearly Total kWh	Annual Cost @ $.15kWh	Potential Annual Savings	Annual kWh Saved
Existing	Body Shop	2L 2x4 T8	88	58	5.104	7.5	180	1350	6,890	$1,034		
Retrofit	Body Shop	Occupancy sensors	88	58	5.104	6	180	1080	5,512	$827	$207	1,378
Existing	Paint Booth	4L 2x4 T12	12	140	1.68	7.5	180	1350	2,268	$340		
Retrofit	Paint Booth	4L 2x4 T8	12	114	1.368	2	180	360	492	$74	$266	1,776
Existing	Body Shop Classroom	2L 2x4 T8	16	58	0.928	7.5	180	1350	1,253	$188		
Retrofit	Body Shop Classroom	Occupancy sensors	16	58	0.928	5.5	180	990	919	$138	$50	334
Existing	Auto Tech	2L 2x4 T8	88	58	5.104	7.5	180	1350	6,890	$1,034		
Retrofit	Auto Tech	Occupancy sensors	88	58	5.104	5.5	180	990	5,053	$758	$276	1,837
Existing	Auto Tech Classroom	2L 2x4 T8	16	58	0.928	7.5	180	1350	1,253	$188		
Retrofit	Auto Tech Classroom	Occupancy sensors	16	58	0.928	5.5	180	990	919	$138	$50	334
									Yearly Total kWh	Annual Cost @ $.15kWh	Potential Annual Savings	Annual kWh Saved
									18,554	$2,783	$849	5,659

Lighting incentives are provided by Efficiency Maine for suggested recommendations. If the total incentive request is greater than $1000: **Pre-approval is required** before you purchase and install the lighting equipment. Detailed information on lighting incentives can be found at:

http://www.efficiencymaine.com/business_programs_lighting_guide.htm
http://www.efficiencymaine.com/pdfs/IndustrialLight.pdf

Lighting controls are very effective when an area is not in use; reduced lighting levels save energy and operating expense. There are several ways of applying controls in buildings such as:

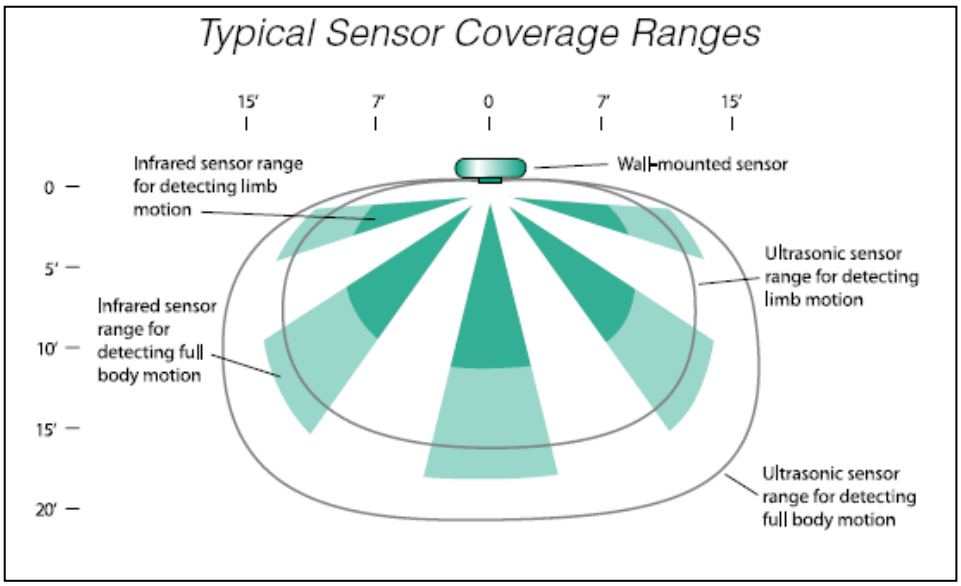
- Occupancy sensors- passive infrared
- Manual or building system activated timer switches
- High/low switched ballasts
- Building time clock or automated control systems
- Daylight harvesting sensors or dimming



Rensselaer Polytechnic Institute lighting study for entire building based on lights on for 10 hours

Occupancy sensors are an excellent way to combat the electrical energy bill. Lighting usually accounts for 30-40% of the building's energy bill, yet many areas may be unoccupied for large parts of the day. Occupancy sensors save energy as indicated by a Rensselaer Polytechnic Institute lighting study that shows savings of over 40%.

There are basically two types: Passive Infrared (PIR) which responds to changes in infrared background by movements in the area and Ultrasonic (US) units which generate high frequency sound waves to monitor changes in the signal return to detect occupancy.



There are also multi-technology units that combine both sensors for accurate monitoring with minimum false triggering. The following web site provides a good introduction for lighting control and application of occupancy sensors for your information: http://www.lightingtaxdeduction.org/technologies/intro-lighting-controls.html

The Efficiency Maine program provides prescriptive cash incentives for occupancy sensors which can be found at the following web site: http://www.efficiencymaine.com/pdfs/OccupancySensors.pdf. The incentives are available for:

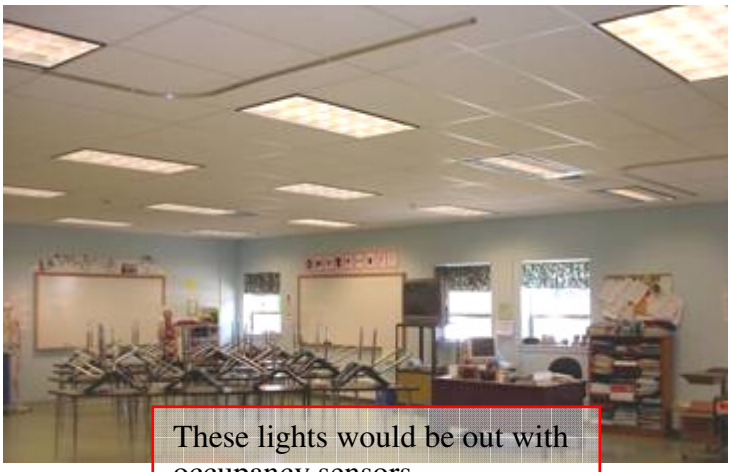
- retrofit into existing fixtures
- wall mounted controls for individual or a bank of lights
- integration with new fixtures

In general, controls are essential in achieving the overall goal of reduced energy consumption. Reducing the energy consumption of the lighting system will typically result in additional tangible savings and benefits by lowering the internal heat gain in the space, thereby changing the needs for supplemental **heating, cooling, and ventilation**.

While occupancy sensors is a cost effective measure it does create frequent switching which may reduce fluorescent lamp life hours, but the **calendar life will be considerably longer**. Also new "Programmed Rapid Start" ballasts significantly improve the life of frequently switched lamps. Daylight sensing controls are an effective and comfortable way to optimize energy use in rooms where abundant daylight is available for at least 25% of the time.

For your consideration regarding motion sensors: a general rule of thumb for motion sensing controls is that cost effectiveness varies depending on the overall energy management skills of staff. People who are personally careful with energy outperform motion sensors, but for less well managed spaces, motion sensors are worthwhile.

There are a number of measures that may be applicable to help you generate and sustain energy savings such as employee awareness, a lighting plan, occupancy sensors, replacing incandescent lights with compact fluorescents, and rescheduling janitorial service.



These lights would be out with occupancy sensors

Summary: Contact your local electrical supplier or electrician (most are familiar with Efficiency Maine's lighting program) for an estimate and be sure to mention the prescribed cash incentives. The Efficiency Maine Program has **prescribed lighting cash incentives.** If the total incentive request is greater than $1000: **Pre-approval is required** before you purchase and install the equipment. Detailed information on lighting incentives can be found at:

http://www.efficiencymaine.com/pdfs/Prescriptive-Cash-Incentives.pdf

http://www.efficiencymaine.com/business_programs_lighting_guide.htm

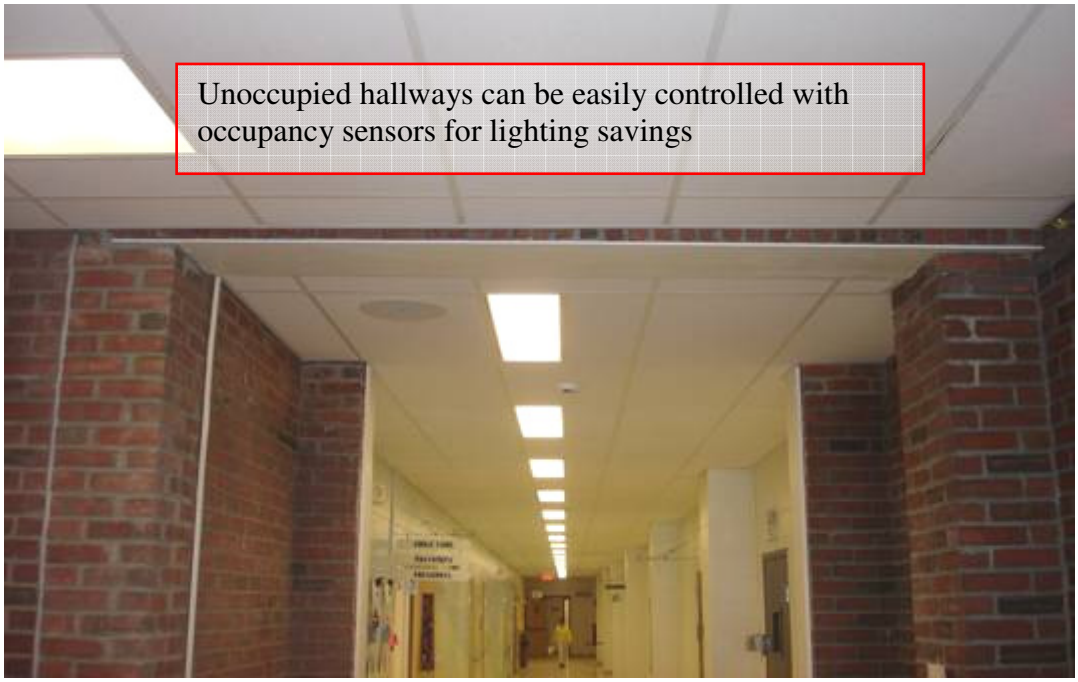
http://www.efficiencymaine.com/pdfs/IndustrialLight.pdf

There is also a list of program allies which consist of contractors, suppliers, engineers, etc for your area which can viewed at the following web site:

http://gdsit.gdsassociates.com/efficiencymainesearch/results.asp

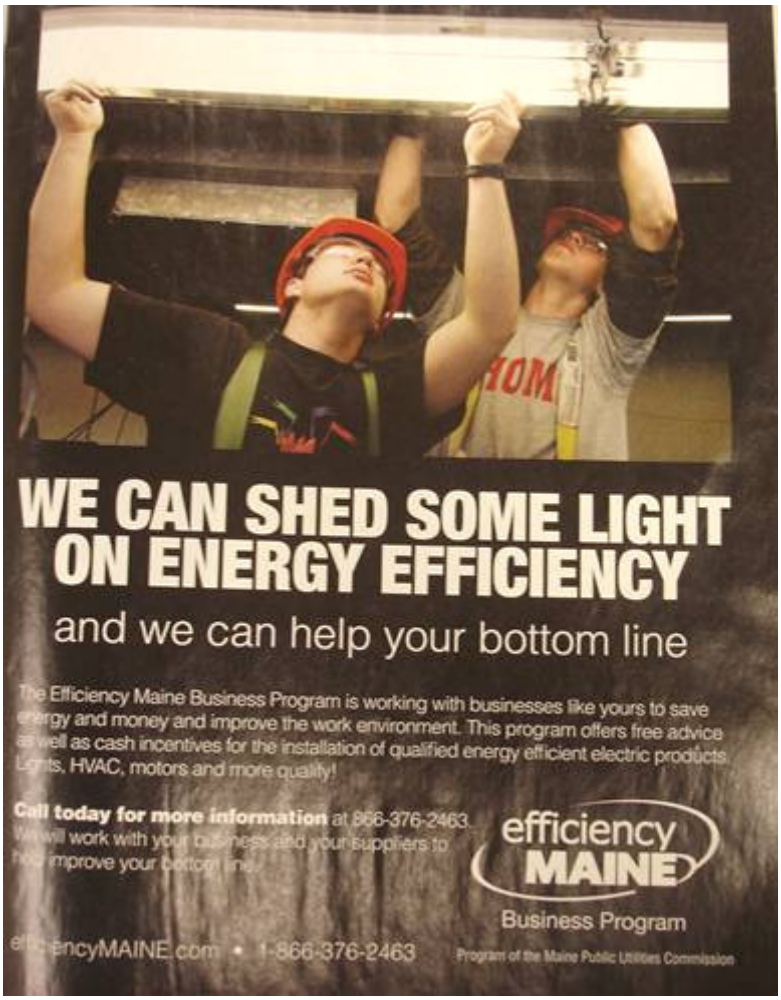
There is a good introduction to the differences and savings of T12 vs. T8 lighting at the following web site:

ENERGY-SAVING T8 AND SUPER T8 LAMPS
http://www.lightingtaxdeduction.org/technologies/t8.html



The restroom in the horticulture classroom has a new ceiling mounted occupancy sensor installed. There were wall/switch mounted occupancy sensors installed in various other rooms in the building that were found to be in the override mode. The most effective occupancy sensors are wall or ceiling mounted.

Waldo County Technical Center electrical students installing new efficient lights in the school – this picture was in several national periodicals to include Newsweek.



BUILDING ENVELOPE

Do-It-Yourself Measures:

- ☐ **Weather-strip doors and windows**
- ☐ **Repair broken or cracked windows**
- ☐ **Caulk around door and window frames**
- ☐ **Seal building penetrations**

Service Technicians:

- ☐ **Insulate/Increase wall insulation**
- ☐ **Double glaze windows**
- ☐ **Replace R-2 rated wood doors w/ R-10 rated foam core, steel clad doors**
- ☐ **Add insulation to roof/ceiling**
- ☐ **Construct vestibule entrance**

Comments: The building was constructed in 1975 with an addition in 1994. The building is a steel structure with brick masonry and a membrane roof system. The material condition of the school is good.

The attic areas were not accessible. Any additional insulation that can be added to the ceiling/attic area will reduce energy losses.

HEATING SYSTEM

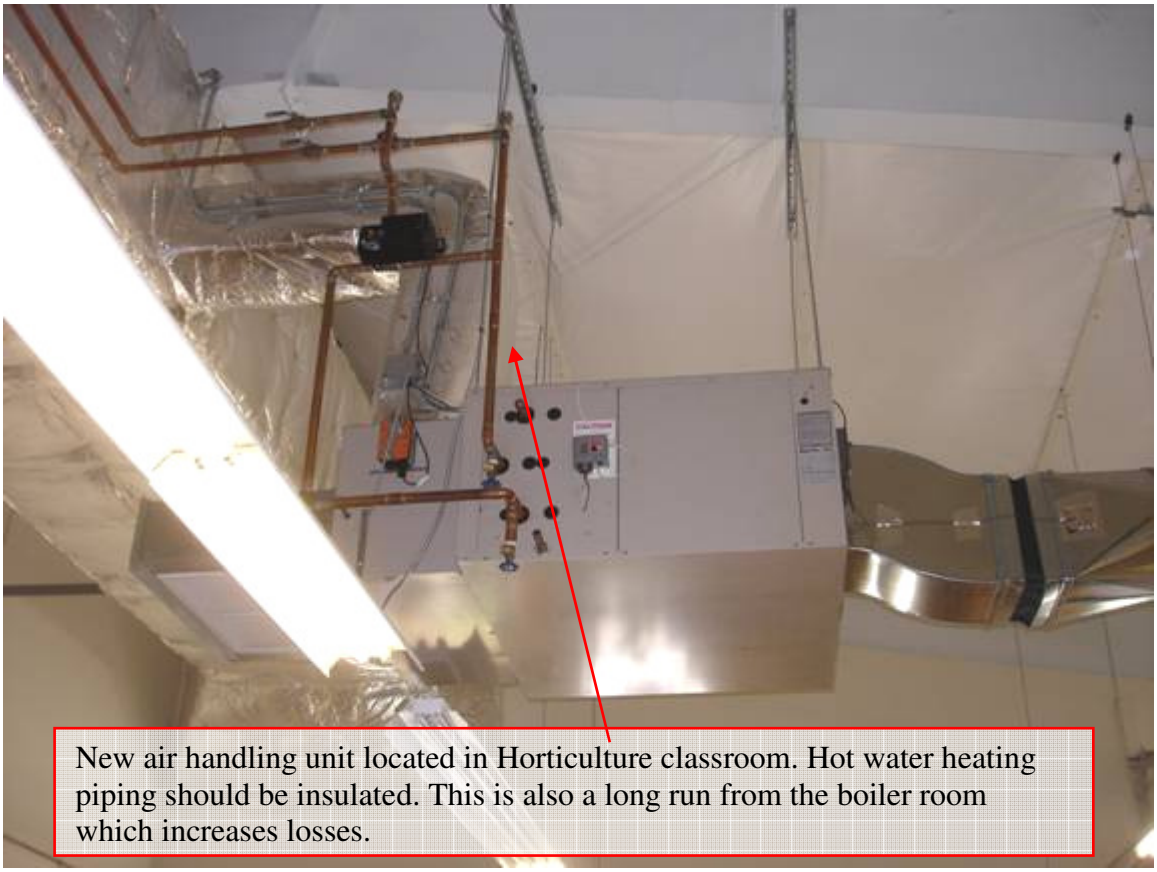
Do-It-Yourself Measures:

- ☐ **Lower Heating Temperature**
- ☐ **Install New Furnace Filter as needed**

Service Technician:

- ☐ **Improve Controls**
- ☒ **Clean Heat Exchange Surfaces Annually**
- ☐ **Convert to Alternative Fuel**
- ☐ **Seal Leaky Air Ducts with Mastic**
- ☐ **Insulate Pipes/Ductwork**
- ☒ **Clean, Tune, & Evaluate Burner**
- ☐ **Install New Burner**
- ☐ **Replace Heating System**

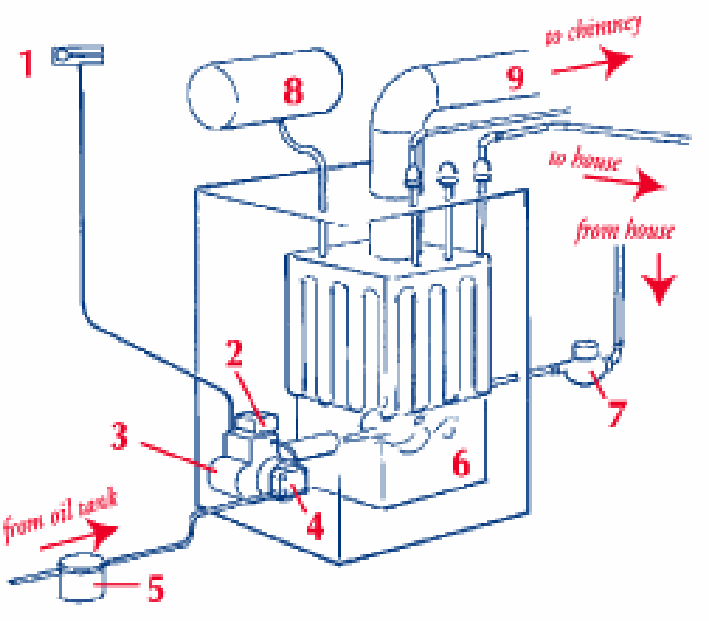
Comments: Heat is provided by two 29 gallon/hour oil fired Smith cast iron boilers that were installed in early 2002. They operate alternately and are fueled by a 10,000 gallon underground storage tank. There are two 5 HP circulation pumps that also operate alternately on a monthly basis. Suggest you install a data logger on the boilers to determine actual fire time of each boiler.



New air handling unit located in Horticulture classroom. Hot water heating piping should be insulated. This is also a long run from the boiler room which increases losses.

Below is a schematic of a typical Hydronic Oil Boiler System:

The thermostat (1) sends a signal to the controls (2) on the burner (3). The fuel pump (4) draws oil through a filter (5) to the burner. The burner turns the oil into a fine spray, mixes it with air and ignites it in the combustion chamber (6), causing the chamber to get very hot. Water circulates around the combustion chamber. A circulator (7) pumps the heated water through radiators or baseboards to heat the space. An expansion tank (8) adjusts to varying pressures. Eventually, the water returns to the heating unit to begin the cycle again. Combustion emissions are vented out the flue (9).

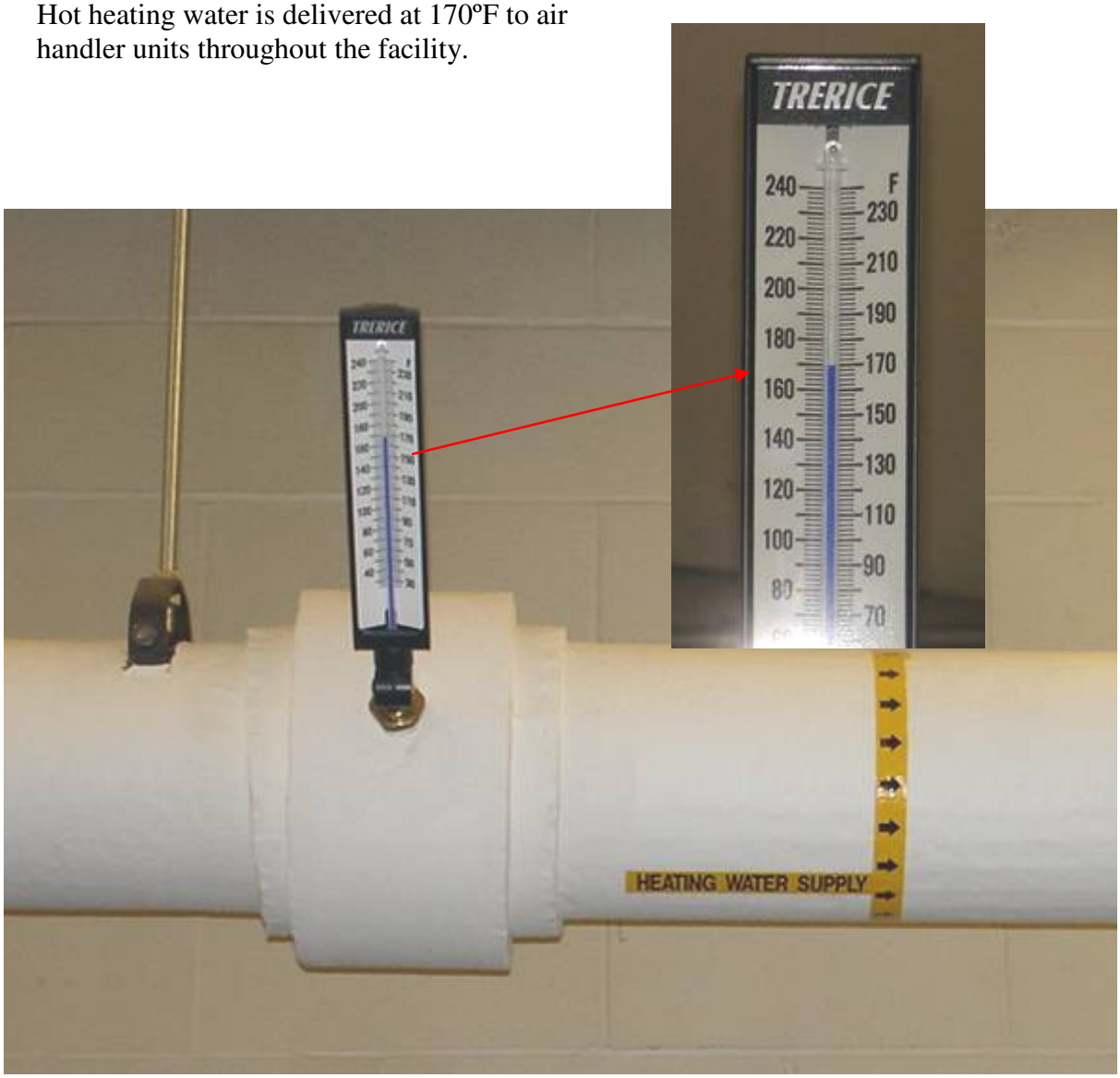


It was noted that there are manual and automated thermostats. The scope of this audit does not provide for a comprehensive review of heating, ventilation and air conditioning controls. Digital controls with set back capabilities after hours and weekends are essential to conserving energy.

In the new classroom there are digital controls. It is recommended that a comprehensive review of the controls be conducted for the older section of the building.

There is a general rule of thumb that is applicable to reducing thermostats: for each degree you lower the thermostat, you can save between 1-3% of your energy bill.

Hot heating water is delivered at 170ºF to air handler units throughout the facility.



DOMESTIC HOT WATER

Do-It-Yourself Measures:

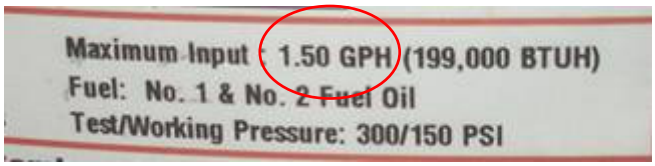
- ☐ **Lower temperature settings**
- ☐ **Flush tank to remove sediment**
- ☐ **Install flow restrictors on showers & faucets**
- ☒ **Insulate pipes**
- ☐ **Repair Leaky Faucets**

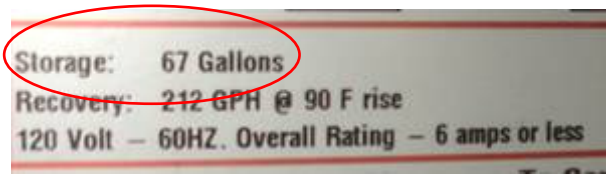
Service Technician:

- ☒ **Install point-of-use water heaters**
- ☐ **Repair leaks**
- ☐ **Clean coil of scale buildup**
- ☐ **Switch fuel type**
- ☐ **Install or reset time clocks**

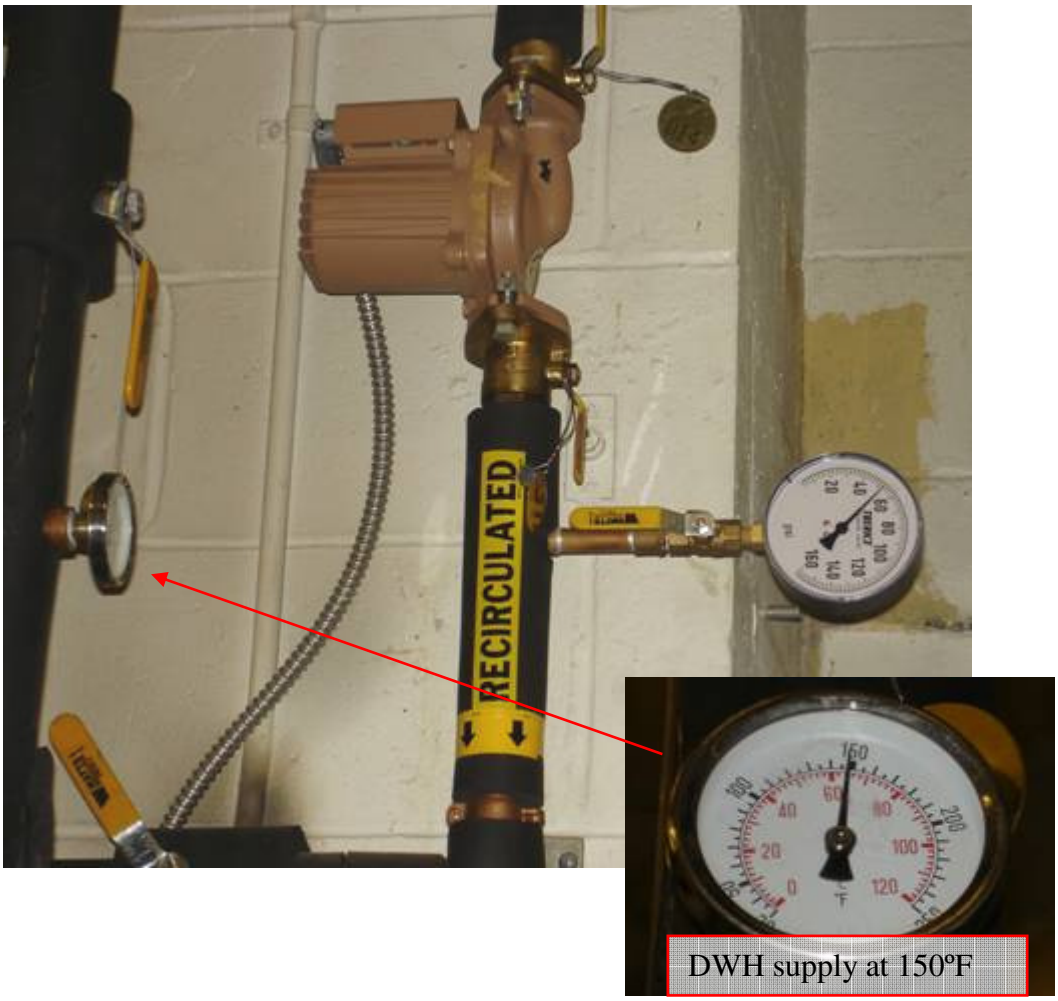
Comments: There are two domestic water heaters (DWH). One system provides DWH during the heating season utilizing heating coils in the boiler. The second system provides hot water during the off heating season with a 1.25 gallon an hour oil-fired 67 gallon water heater. Both of these systems are piped together and there are various valve configurations that allow for one system to be shut off (with valves) depending on the season.

Hot water coil in the boiler





There is a circulation pump installed in the DWH piping that continuously circulates the hot water throughout the facility to ensure the kitchen, restrooms and other sinks in the building have hot water readily available. The supply side of the domestic water temperature was 150°F.

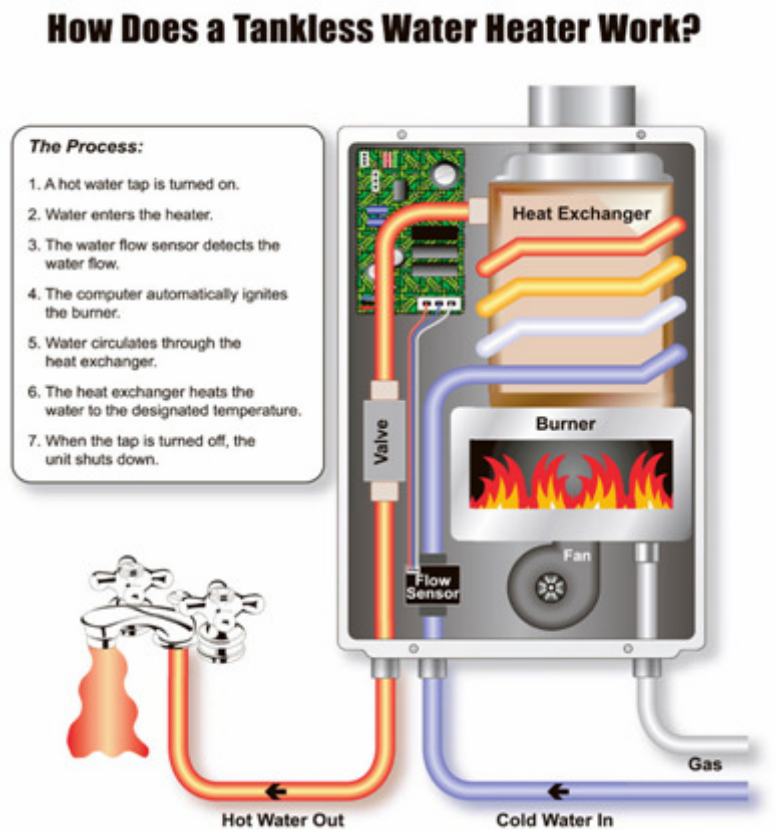


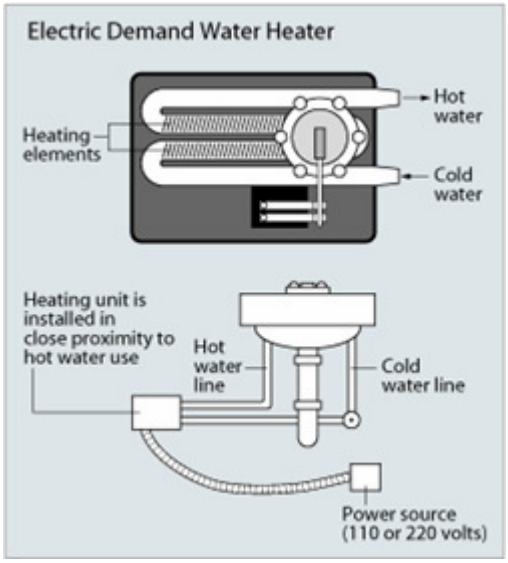
Recommend that at a minimum you investigate the installation of an electronic/mechanical control for the 67 gallon DWH that shuts off the circulation pump after hours and weekends.

As an alternative, you should investigate/consider an “on-demand” (tankless or instantaneous) water heater. They provide hot water only as it is needed. Demand water heaters heat water directly without the use of a storage tank. Therefore, they avoid the standby heat losses associated with storage water heaters, which can save you money. When a hot water tap is turned on, cold water travels through a pipe into the unit and an electric element heats the water. As a result, demand water heaters deliver a constant supply of hot water. You do not need to wait for a storage tank to heat up and you only consume energy when you open the faucet.

Typically, demand water heaters provide hot water at a rate of 2–5 gallons (7.6–15.2 liters) per minute.

- Gas-fired demand water heaters produce higher flow rates at around 5-8 gallons per minute.
- Electric ones provide approximately 2 gallons per minute.





Additional information on tankless water heaters can be found at the following Department of Energy web site: http://www.eere.energy.gov/consumer/your_home/water_heating/index.cfm/mytopic=12820

You can also look at www.rinnai.us for domestic and commercial grade on-demand propane heaters and the following site for electric on demand water heaters http://www.hotwatersource.com/eltawahe.html .

You should consider a detailed review of your existing domestic hot water system. You could consider installing on-demand electric water heaters at the restrooms and stand alone sinks and relocate the existing oil-fired 67 gallon DWH to the kitchen or install an on-demand propane fired water heater. Either way, you would eliminate the constant circulation loop that continuously requires either the boiler or the DWH tank to fire to ensure there is hot water available at the taps even after hours and during the summer.

The three tables below indicate conceptual estimates for potential energy savings for various reconfigurations of the existing DWH system. It is noted that the heating boilers run for approximately 155 days. The remainder of the year, 210 days, the oil-fired DWH operates. The assumption is that electric on-demand heaters are installed at restrooms and stand alone sinks throughout the facility and the existing DWH will be moved to the café kitchen or be replaced with on-demand propane. The estimated savings are listed below:

Hot Water Tank moved to Café Kitchen												
	Location	Fixture type	# of fixtures	Gals per hour	Gals per day	Hrs/ Day	# of Days	Annual Operating Hours	Yearly Total gals	Annual Cost @ $3.15 gal	Potential Annual Savings	Annual kWh Saved
Existing	Boiler room	67 Gallon oil Hot water tank	1	1.5	4.5	3	210	630	945	$2,977		
Retrofit	Kitchen	67 Gallon oil hot water tank moved to Kitchen	1	1.5	3	2	180	360	540	$1,701	$1,276	405
											Potential Annual Savings	Annual kWh Saved
										Savings	$1,276	405

Potential savings for installing on-demand propane in the café kitchen:

Existing Hot Water Tank Replaced with On Demand Propane												
	Location	Fixture type	# of fixtures	Gals per hour	Gals per day	Hrs/ Day	# of Days	Annual Operating Hours	Yearly Total gals	Annual Cost @ $3.15 gal	Potential Annual Savings	Annual kWh Saved
Existing	Boiler room	67 Gallon oil hot water tank	1	1.5	4.5	3	210	630	945	$2,977		
Retrofit	Kitchen	On demand propane	1	0.75	1.125	1.5	180	270	303.75	$911	$2,066	641
											Potential Annual Savings	Annual kWh Saved
										Savings	$2,066	641

Potential cost to operate on-demand electric water heaters in restrooms and stand alone sinks.

Install On Demand Electric Hot water Heaters												
	Location	Fixture type	# of fixtures	Watts per Fixture	Daily Total kWh	Hrs/ Day	# of Days	Annual Operating Hours	Yearly Total kWh	Annual Cost @ $.15kWh	Potential Annual Savings	Annual kWh Saved
Existing	Restrooms and standalone	On Demand Electric	7	3000	21	1	180	180	3780	$567		

AIR CONDITIONING

Do-It-Yourself Measures:

- ☐ **Clean outside air & return grilles**
- ☐ **Clean or replace air filters as needed**
- ☐ **Raise Cooling Temperatures**
- ☐ **Install Tinted Shades on South-Facing Windows**
- ☐ **Service Air Dampers**
- ☐ **Shut down ventilation system during unoccupied times**
- ☐ **Clean Cooling Coil Surfaces**
- ☐ **Complete Scheduled Maintenance Improvements**

Service Technician:

- ☐ **Seal leaky air ducts**
- ☐ **Vent Bathroom to Outdoors**
- ☐ **Improve Controls**
- ☐ **Evaluate System Efficiency**
- ☐ **Reduce ventilation rates where possible**
- ☐ **Replace or modify outside air dampers**
- ☐ **Improve Pipe/Duct Insulation**
- ☐ **Repair Leaks**

Comments: The scope of this walk-through audit does not provide a detailed air conditioning assessment. It is suggested that you consider a comprehensive assessment of your air conditioning and ventilation systems to determine if efficiency and energy savings may be obtained.

Below is a table that assumes a typical portable window air conditioning unit operating eight hours a day over a four month period

	Location	Fixture type	# of fixtures	Watts per Fixture	Daily Total kWh	Hrs/ Day	# of Days	Annual Op Hours	Yearly Total kWh	Annual Cost @$.15kWh
Existing	Room	6,000 Btu Air Conditioner	1	1200	1.2	8	120	960	1152	$173

There is a general rule of thumb that is applicable to raising thermostats: for each degree you raise the thermostat during the cooling season, you can save between 1-3% of your energy bill.

Cash Incentives for Air Conditioning can be found at the following web site:
http://www.efficiencymaine.com/pdfs/Prescriptive-Cash-Incentives.pdf

http://www.efficiencymaine.com/pdfs/Rooftop-SAW.pdf

VENTILATION

Do-It-Yourself Measures:

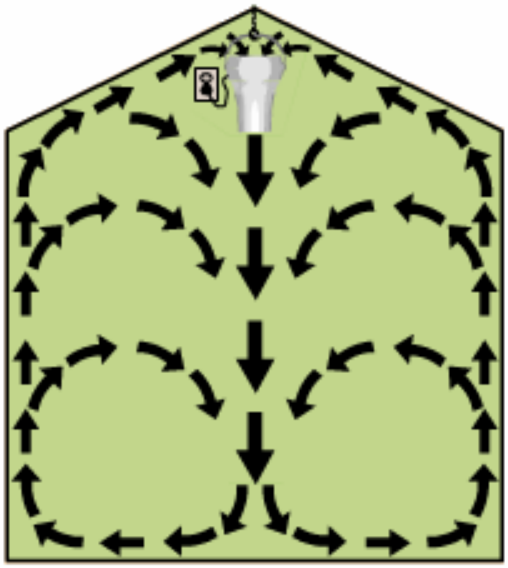
- ☐ **Clean outside air & return grilles**
- ☒ **Clean or replace air filters as needed**
- ☐ **Service Air Dampers**
- ☐ **Shut down ventilation system during**

Comments: The scope of this walk-through audit does not provide a detailed air conditioning assessment. It is suggested that you consider a comprehensive assessment of your air conditioning and ventilation systems to determine if efficiency and energy savings may be obtained.

Ventilation is provided by operable windows, doors, and the air conditioning system. Thermostatic controls should be reviewed to ensure they are in optimal working condition during fan only modes.

The ceilings are approximately 20 feet high in the shop areas. There is a new air flow technology available that collimates the air from the ceiling and transports it to the floor creating thermal equalization more efficiently than ceiling fans.

Ceiling fans mix the air and in high bay areas they typically do not mix the air at the lower levels (where the people are). The new turbo fans take up significantly less room than a ceiling fan and they are very effective at reducing dead zones, cold spots and hot spots within the room. This technology can be viewed at: http://www.mainegreenbuilding.org/Instance-20.html .



The installation of the units may help to stabilize the temperature in the room during the winter and summer months and provide personnel comfort and result in energy savings.

This is achieved by stabilizing the temperature in the entire air column and reducing the heat/cool on/off cycle that is typical in high bay spaces. It is also important to understand that the thermostats are typically installed at approximately five feet above the finished floor. Rooms with high ceilings have to heat the entire air column to satisfy the thermostat setting which typically results in a peak ceiling temperature that is 5 to 10 degrees warmer than the floor temperature. Thermal equalization enhances comfort and reduces energy consumption.

REFRIGERATION

Do-It-Yourself Measures:

- ☐ **Replace Door Gaskets**
- ☐ **Clean Condenser/Coil Surfaces**
- ☒ **Maintain Correct Temperature Settings**
- ☐ **Log System Performance Settings**

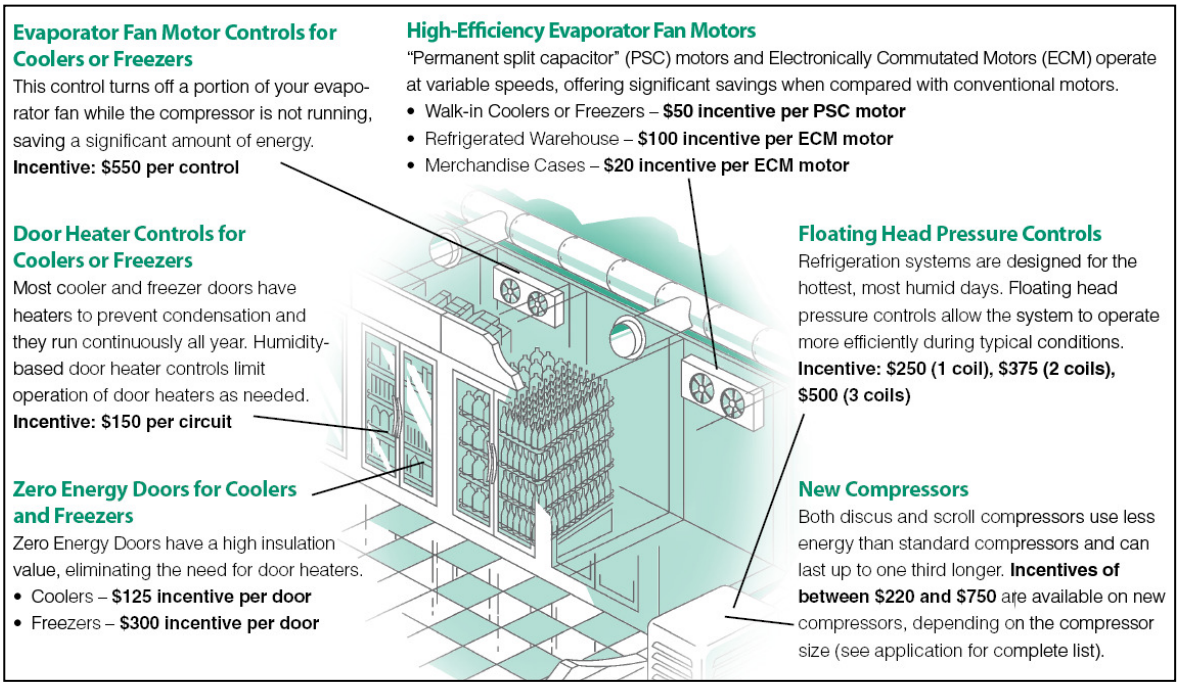
Service Technician:

- ☐ **Maintain Proper Refrigerant Levels/Press.**
- ☐ **Maintain Proper Operating Pressures**
- ☐ **Install Outside Economizer**
- ☐ **Install Glass Door Heater Control**

Comments: The café kitchen has a walk-in refrigerator. It was reported during the audit that during summer and long vacation periods the items are moved into a stand alone refrigerator and the walk-in is shut down. This is a good energy measure.

Efficiency Maine **Cash Incentives** for refrigeration is listed at the web site: **http://www.efficiencymaine.com/pdfs/Prescriptive-Cash-Incentives.pdf**

Efficiency Maine **Refrigeration technical data sheets** can be found at the web site: http://www.efficiencymaine.com/pdfs/Energy-Efficient-Refrigeration-TDS07.pdf



MOTORS

Do-It-Yourself Measures:

☐ **Lubricate Bearings**
☒ **Check/Replace Belts**
☐ **Clean Motor Housing**

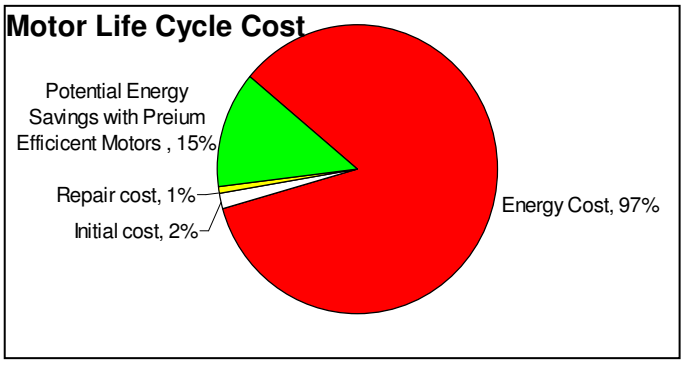
Service Technician:

☒ **Evaluate Motor Efficiency**
☒ **Match Motor Size to Loads**
☐ **Replace with More Efficient Model**
☐ **Consider Installing Variable Speed Drive**

Comments: The scope of this walk-through audit does not provide a detailed motor assessment. It is suggested that you consider a comprehensive assessment of your motors to determine if efficiency and energy savings may be obtained. Below is a table of two motors with the estimated annual cost to operate.

	Location	Fixture type	# of fixtures	Watts per Fixture	Daily Total kWh	Hrs/ Day	# of Days	Annual Operating Hours	Yearly Total kWh	Annual Cost @ $.15kWh	Potential Annual Savings	Annual kWh Saved
Existing	Boiler Room	5 HP Compressor water	1	3000	3	2	365	730	2190	$329		
Existing	Boiler Room	5HP Circulation Pump hot water heat	1	3000	3	18	120	2160	6480	$972		

General information on motors and Adjustable Speed Drives (ASD): Motors are designed to run at a constant speed. However, motor drive systems are often operated at part or variable load. In particular, fans and pumps can have highly irregular load profiles. This means, the motors on these systems either run at constant speed bypassing the excess capacity, or use some form of capacity regulation such as dampers, valves, or inlet guide vanes, all of which are very inefficient. Premium efficient motors can save up 15% of energy cost and up to 50% by controlling or adjusting the speed of the motor using one of five different types of Adjustable Speed Drives (ASDs):



- Variable Frequency Drives (VFDs)
- DC Adjustable Speed Drives
- Eddy Current Drives
- Hydraulic Drives
- Mechanical Drives

Typically, VFDs offer higher efficiencies, are easier to control, require less maintenance, and have become the drive of choice in the majority of applications. In addition, speed

control is generally the most energy efficient flow control technique because it requires the least amount of energy to meet the given load.

Cash incentives for motors are listed at the following web site:

http://www.efficiencymaine.com/pdfs/Prescriptive-Cash-Incentives.pdf

Technical data sheets for motors can be viewed at the following web sites:

http://www.efficiencymaine.com/pdfs/Plan-Ahead-Before-Motors-Fail-TSD.pdf

http://www.efficiencymaine.com/pdfs/Variable-Frequency-Drives.pdf

http://www.efficiencymaine.com/pdfs/Compressed_Air_TDS.pdf

ELECTRONIC EQUIPMENT

Do-It-Yourself Measures:

☒ **Turn Off Equipment When Possible** ☐ **Adjust Settings to Improve Efficiency**

☐ **Upgrade to More Efficient (Energy Star) Model**

Do-It-Yourself Measures:

☒ **Turn Off Equipment When Possible** ☐ **Adjust Settings to Improve Efficiency**

☐ **Upgrade to More Efficient (Energy Star) Model**

Comments: Most new office equipment is Energy Star compliant and has energy saving software installed. Consult your manual for activating this feature.

Simply shutting off the computer monitor when not in use saves the equivalent of turning off a 60 to 100 watt light bulb. "Screen Savers" require as much energy as leaving your monitor on. "Sleep" mode lowers energy consumption to about 25 watts or less. Establish an office policy to shut down all non-essential computers nightly (i.e., servers and computers that are not externally accessed after office hours). See table below for a typical desk top computer savings.

There is a potential annual savings from **$12-75 a year per computer** by simply shutting the computer off at the end of the work day and programming the sleep mode during the work day. See examples below:

The first example shows the savings of a computer left on 24/7 vs. a typical work day of eight hours for five day work week:

	Location	Fixture Type	Number of Fixtures	Watts per Fixture	Total kW	Hours/ day	# of Days	Annual Operating Hours	Total kWh	Annual Cost @ $.15/kWh	Potential Annual Savings	Annual kWh Saved
1. Existing	Office	Computers on 24 hrs /day/ 7 days	1	75	0.075	24	365	8760	657	$99		
1. Retrofit	Office	Computers on 8hrs /day /5 days	1	75	0.075	8	260	2080	156	$23	$75	501
										SAVINGS	$75	501

The second example shows the savings of a computer left on 24 hours a day for a typical five day work week vs. eight hours a day for a typical five day work week:

	Location	Fixture Type	Number of	Watts per Fixture	Total kW	Hours/ day	# of Days	Annual Operating	Total kWh	Annual Cost @ $.15/kWh	Potential Annual	Annual kWh
1. Existing	Office	Computers on 24 hrs /day/ 5 days	1	75	0.075	24	260	6240	468	$70		
1. Retrofit	Office	Computers on 8hrs /day/ 5 days	1	75	0.075	8	260	2080	156	$23	$47	312
										SAVINGS	$47	312

The last example shows the savings for a computer left on eight hours a day for a five day work week vs. a computer programmed for sleep mode with an average on time of four hours a day for a typical five day work week.

	Location	Fixture Type	Number of Fixtures	Watts per Fixture	Total kW	Hours/ day	# of Days	Annual Operating Hours	Total kWh	Annual Cost @ $.15/kWh	Potential Annual Savings	Annual kWh Saved
1. Existing	Office	Computers on 8 hrs /day/ 5 days	1	75	0.075	8	260	2080	156	$23		
1. Retrofit	Office	Computers sleep mode on 4hrs /day/ 5 days	1	75	0.075	4	260	1040	78	$12	$12	78
										SAVINGS	$12	78

As you can see, it is important to have an office policy regarding computers. Education is a key component in achieving savings with computers such as publishing the potential savings on the employee bulletin board. In a typical office, people attend meetings, take coffee and lunch breaks, etc. which are all opportunities for computer energy savings.

There are a number of measures that may be applicable to help you generate and sustain energy savings such as ensuring copy machines and other equipment are programmed for sleep modes. Below is an example of a typical large stand alone office copier.

- Example 1: The copier is left on 24/7/365days. The retrofit configures the copier to be on 8 hours a day for a five day work week without the energy savings setting selected.

	Location	Fixture Type	Number of Fixtures	Watts per Fixture	Total kW	Hours/ day	# of Days	Annual Operating Hours	Total kWh	Annual Cost @ $.15/kWh	Potential Annual Savings	Annual kWh Saved
1. Existing	Office	Copier 24/7	1	1440	1.44	12	365	4380	6,307	$946		
1. Retrofit	Office	Copier 8hrs for 5 days a day w/out energy savings selected	1	1440	1.44	8	260	2080	2,995	$449	$497	3,312

- Example 2: The copier is on 24/7/260 days. The retrofit configures the copier with the energy savings mode selected which results in an approximate “on time” of four hours per day (could be less) during a normal work week.

	Location	Fixture Type	Number of Fixtures	Watts per Fixture	Total kW	Hours/ day	# of Days	Annual Operating Hours	Total kWh	Annual Cost @ $.15/kWh	Potential Annual Savings	Annual kWh Saved
1. Existing	Office	Copier 8 hrs for 5 days	1	1440	1.44	8	260	2080	2,995	$449		
1. Retrofit	Office	Copier 8hrs for 5 days with energy savings selected	1	1440	1.44	4	260	1040	1,498	$225	$225	1,498

Therefore, standing by the copier waiting for the 30 second warm up period can result in energy savings and ensuring the copier machine is off or programmed for sleep mode after hours and weekends will result in significant savings.

MISCELLANEOUS

Another way to maximize overall energy efficiency is to consider employee involvement. They may have energy conservation suggestions for their area. Sometimes an employee incentive program provides helpful cost savings measures.

Delivered to you during the walk-through audit for your continued energy management plan were various resource materials such as "Energy Efficiency Pays – A Guide for the Small Business Owner". These resources will provide appropriate information on a variety of building systems.

There are a variety of valuable information and resources available from the "Efficiency Maine - Business Program". Information can be obtained by:

- Visiting the **www.efficiencyMAINE.com** website.
- Or calling 1-866-376-2463
- There are specific prescribed cash incentives for lighting, motors, air conditioning systems, etc. They can be found at the following web site:
  - **http://www.efficiencymaine.com/pdfs/Prescriptive-Cash-Incentives.pdf**.
- Should you need additional contractor/product information, please consult with an Efficiency Maine Participating Program Ally, listed under the "Business Section" which can viewed at the following web site:
  - **http://gdsit.gdsassociates.com/efficiencymainesearch/**
- The Small Business Low Interest Loan Program is to assist small commercial, non-profit, and manufacturing facilities (less than 50 FT employees or less than $5,000,000 in annual sales) with funding Efficiency Maine-approved energy conservation measures by providing loans up to $35,000 at 3% interest (current fixed rate). The Maine Public Utilities Commission's Efficiency Maine Program, administers this program. Additional information can be found at the following web site:
  - **http://efficiencymaine.com/business_programs_sblilp.htm**
- Other valuable resources for energy information can be located on the website **www.maineenergyinfo.com**. It is a cooperative project of nine state agencies to provide easy access to Maine energy information.

In summary, there are a number of energy reducing consumption opportunities identified for your school. We hope you take the opportunity to review and investigate these potential saving opportunities. For specific questions or comments regarding this report, you may contact:

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